CLAIMS

1. A home terminal apparatus for sending/receiving packet data to and from a router that is connected to an external network to which a server apparatus is connected, the home terminal apparatus being connected to the router via a home network, comprising:

a packet generation unit operable to generate packet data to be sent to the server apparatus;

a judgment unit operable to judge a sending interval at which said packet data is sent; and

a communication unit operable to send/receive the packet data to and from the server apparatus via the router,

wherein the communication unit sends the packet data periodically and repeatedly to the router according to the sending interval.

2. The home terminal apparatus according to Claim 1,

wherein the router includes:

an assignment unit operable to assign a unique local address to the home terminal apparatus; and

a holding unit operable to hold a corresponding relationship between a global address assigned to the router and the local address of the home terminal apparatus for a predetermined period of time, and

the home terminal apparatus further comprises a detection unit operable to detect said predetermined period of time during which the corresponding relationship is held in the router,

wherein the judgment unit judges that the period detected by the detection unit or a period shorter than said period is the sending interval.

3. The home terminal apparatus according to Claim 1,

wherein the packet generation unit generates the packet data

to be sent to the server apparatus that includes at least the following information in a header part: (i) the local address of the home terminal apparatus as a sender's address; (ii) a local port number of the home terminal apparatus as a sender's port number; (iii) an address of the server apparatus as a destination address; and (iv) a port number of the server apparatus as a destination port number, and that includes at least the following information in a data part: (i) a unique terminal ID of the home terminal apparatus; and (ii) a response interval at which response packet data is sent as a response from the server apparatus.

4. The home terminal apparatus according to Claim 3,

wherein the judgment unit judges that the sending interval should be shortened, when the communication unit has not received the response packet data from the router within the sending interval.

5. The home terminal apparatus according to Claim 3,

wherein the packet generation unit generates a plurality of packet data in which the destination port number, the sender's port number and the response interval are different from packet data to packet data,

the communication unit sends, all at once, said plurality of packet data generated by the packet generation unit, and

the detection unit detects the predetermined period of time during which the corresponding relationship is held in the router, from the response interval at which the response packet data is sent.

6. The home terminal apparatus according to Claim 5,

wherein the detection unit detects a longest response interval as the predetermined period of time in the router, out of a plurality

of response packet data sent by the server apparatus in response to the plurality of packet data sent by the home terminal apparatus.

7. The home terminal apparatus according to Claim 3,

wherein the server apparatus includes:

a second communication unit operable to send/receive the packet data;

a response interval adjustment unit operable to obtain the response interval included in the packet data at which the response packet data is sent to the home terminal apparatus, and determine a response period during which the response packet data should be sent; and

a second packet generation unit operable to generate the response packet data to be sent to the home terminal apparatus,

wherein the second communication unit sends, to the router, the response packet data generated by the second packet generation unit according to said response period.

8. The home terminal apparatus according to Claim 7,

wherein a mobile terminal device for sending a control request to control the specific home terminal apparatus is further connected to the external network, and

the second packet generation unit in the server apparatus generates control packet data including the control request which is sent by the mobile terminal device and received by the second communication unit.

9. The home terminal apparatus according to Claim 8, further comprising a control unit operable to control said home terminal apparatus according to the control request.

10. The home terminal apparatus according to Claim 9,

wherein a plurality of terminal apparatuses are connected to the home terminal apparatus via the home network,

each of the terminal apparatuses includes an apparatus control unit operable to control said each of the terminal apparatuses itself,

the communication unit sends the control request included in the control packet data to each of the terminal apparatuses, and

the apparatus control unit controls said each of the terminal apparatuses according to the received control request.

11. The home terminal apparatus according to Claim 10,

wherein the control unit receives a control result from the apparatus control unit,

the communication unit sends packet data including said control result to the server apparatus, and

the second communication unit in the server apparatus sends the control result included in the packet data to the mobile terminal device.

12. The home terminal apparatus according to Claim 11,

wherein a portal server is connected to the external network,

the portal server sends, to the server apparatus, a portal server connection request to be sent to the home terminal apparatus with the specific terminal ID,

the second packet generation unit in the server apparatus generates the response packet data that includes an address of the portal server according to said portal server connection request,

the communication unit in the home terminal apparatus receives the response packet data from the router, and

the packet generation unit generates control result packet data that includes at least the control result and the address of the portal server included in the response packet data as a destination

address.

13. The home terminal apparatus according to Claim 12,

wherein the mobile terminal device sends, to the portal server, the control request to be sent to the home terminal apparatus with the specific terminal ID, and

the portal server sends the portal server connection request to the server apparatus, when receiving the control request.

14. The home terminal apparatus according to Claim 12,

wherein the portal server sends, to the mobile terminal device, the control result included in the control result packet data, when receiving the control result packet data from the router.

15. The home terminal apparatus according to Claim 7,

wherein the server apparatus further includes:

a terminal information storage unit operable to store the following information included in the packet data received by the second communication unit as a set of terminal information: the terminal ID of the home terminal apparatus; a global address of the router which is a sender's address; and a global port number of the router which is a sender's port number; and

an extraction unit operable to extract, from the terminal information storage unit, the global address and the global port number which correspond to the terminal ID, when a control request to control the home terminal apparatus with said terminal ID occurs,

wherein the second packet generation unit generates control packet data that includes a control command in accordance with the control request as well as the global address and the global port number extracted by the extraction unit as a destination address and a destination port number, respectively.

16. The home terminal apparatus according to Claim 15,

wherein the second communication unit sends the control packet data to the home terminal apparatus via the router, only when the control request occurs.

17. The home terminal apparatus according to Claim 15,

wherein the second communication unit sends, to the router, the control packet data which does not include the control command, when there is no control request from the mobile terminal device during the response period.

18. The home terminal apparatus according to Claim 3, further comprising a storage unit operable to store a password used for performing authentication on the terminal ID,

wherein the packet generation unit obtains a digest value by inputting, into a predetermined function, the terminal ID and the password which are obtained from the storage unit and a random number, and generates packet data by incorporating the terminal ID, the random number, and the digest value into the data part, and

the communication unit sends the generated packet data to the router, and

the server apparatus further includes:

a second storage unit operable to store an authentication terminal ID and an authentication password, the authentication terminal ID containing information which is the same as information of the terminal ID included in the packet data and the authentication password containing information which is the same as information of the password; and

a second authentication unit operable to obtain an authentication digest value by inputting, into the predetermined function, the authentication terminal ID, the authentication password, and the random number included in the packet data, and

perform authentication on the received packet data by comparing the authentication digest value with the digest value included in the packet data.

19. The home terminal apparatus according to Claim 18,

wherein the packet generation unit obtains the digest value by inputting, into the predetermined function, the terminal ID, the password, the local port number and the random number, and generates packet data that includes the terminal ID, the random number, the digest value, and the local port number, and

the second authentication unit in the server apparatus receives said packet data, obtains an authentication digest value by inputting, into the predetermined function, the authentication terminal ID and the authentication password, and the local port number and the random number included in the packet data, and performs authentication on the received packet data by comparing said authentication digest value with the digest value included in the packet data.

20. The home terminal apparatus according to Claim 19,

wherein the packet generation unit makes the local port number a random number.

21. The home terminal apparatus according to Claim 18,

wherein the second packet generation unit in the server apparatus generates the response packet data that includes the terminal ID and the local port number included in the packet data which are extracted by the extraction unit, and

the home terminal apparatus further comprises an authentication unit operable to obtain the terminal ID and the local port number included in the response packet data, and perform authentication on the response packet data by comparing said

obtained terminal ID and the local port number with the terminal ID and the local port number included in the packet data.

22. The home terminal apparatus according to Claim 1, further comprising an encryption processing unit operable to encrypt and decrypt the packet data.

23. A communication system comprising:

a server apparatus connected to an external network;

a home terminal apparatus connected to a home network; and

a router which connects the external network and the home network,

wherein the home terminal apparatus includes:

a packet generation unit operable to generate packet data to be sent to the server apparatus;

a judgment unit operable to judge a sending interval at which said packet data is sent; and

a communication unit operable to send/receive the packet data to and from the server apparatus via the router,

the router includes:

an assignment unit operable to assign a unique local address to the home terminal apparatus;

a holding unit operable to hold a corresponding relationship between a global address assigned to the router and the local address of the home terminal apparatus for a predetermined period of time; and

a conversion unit operable to make a conversion between the local address and the global address included in the packet data sent by the home terminal apparatus or the server apparatus, with reference to the corresponding relationship, and

the server apparatus includes:

a second communication unit operable to receive the packet

data sent by the home terminal apparatus via the router;

a response interval adjustment unit operable to obtain a response interval included in the packet data at which response packet data is sent to the home terminal apparatus, and determine a response period during which the response packet data is sent; and

a second packet generation unit operable to generate the response packet data to be sent to the home terminal apparatus.

24. The communication system according to Claim 23,

wherein the communication unit in the home terminal apparatus sends the packet data periodically and repeatedly to the router according to the sending interval,

the holding unit in the router holds the corresponding relationship between the global address and the local address of the home terminal apparatus, and

the second communication unit in the server apparatus sends the response packet data according to the response period.

25. The communication system according to Claim 23,

wherein the home terminal apparatus further includes a detection unit operable to detect the predetermined period of time during which the corresponding relationship is held in the router,

wherein the judgment unit judges that the period detected by the detection unit or a period shorter than said period is the sending interval.

26. The communication system according to Claim 23,

wherein a mobile terminal device for sending a control request to control the specific home terminal apparatus is further connected to the external network, and

the second packet generation unit in the server apparatus

receives the control request sent by the mobile terminal device, and generates control packet data including said control request, and

the second communication unit sends the control packet data to the home terminal apparatus via the router.

27. A communication method used for a communication system in which an external network to which a server apparatus is connected and a home network to which a home terminal apparatus is connected are connected via the router, the communication method comprising steps A executed by the home terminal apparatus, steps B executed by the router, and steps C executed by the server apparatus,

wherein the steps A include:

a packet generation step of generating packet data to be sent to the server apparatus;

a judgment step of judging a sending interval at which said packet data is sent; and

a communication step of sending/receiving the packet data to and from the server apparatus via the router,

the steps B include:

an assignment step of assigning a unique local address to the home terminal apparatus;

a holding step of holding a corresponding relationship between a global address assigned to the router and the local address of the home terminal apparatus for a predetermined period of time; and

a conversion step of making a conversion between the local address and the global address included in the packet data sent by the home terminal apparatus or the server apparatus, with reference to the corresponding relationship, and

the steps C include:

a second communication step of receiving the packet data

sent by the home terminal apparatus via the router;

a response interval adjustment step of obtaining a response interval included in the packet data at which response packet data is sent to the home terminal apparatus, and determining a response period during which the response packet data is sent; and

a second packet generation step of generating the response packet data to be sent to the home terminal apparatus.

28. A program for a communication method in which an external network to which a server apparatus is connected and a home network to which a home terminal apparatus is connected are connected via the router, the program comprising steps A executed by the home terminal apparatus, steps B executed by the router, and steps C executed by the server apparatus,

wherein the steps A include:

a packet generation step of generating packet data to be sent to the server apparatus;

a judgment step of judging a sending interval at which said packet data is sent; and

a communication step of sending/receiving the packet data to and from the server apparatus via the router,

the steps B include:

an assignment step of assigning a unique local address to the home terminal apparatus;

a holding step of holding a corresponding relationship between a global address assigned to the router and the local address of the home terminal apparatus for a predetermined period of time; and

a conversion step of making a conversion between the local address and the global address included in the packet data sent by the home terminal apparatus or the server apparatus, with reference to the corresponding relationship, and

the steps C include:

a second communication step of receiving the packet data sent by the home terminal apparatus via the router;

a response interval adjustment step of obtaining a response interval included in the packet data at which response packet data is sent to the home terminal apparatus, and determining a response period during which the response packet data is sent; and

a second packet generation step of generating the response packet data to be sent to the home terminal apparatus.